

What is claimed is:

1. A torque transfer assembly in a motor vehicle, said torque transfer assembly comprising:

a ring gear assembly adapted to deliver an input drive torque;

5 a differential assembly adapted to receive said input drive torque;

at least one output shaft drivingly connected to said differential assembly through a differential gear mechanism;

a friction clutch pack for selectively delivering said input drive torque from said ring gear assembly to said differential assembly, said clutch pack comprising at least one inner

10 friction plate coupled to rotate with said differential assembly and at least one outer friction plate coupled to rotate with said ring gear assembly; and

a hydraulic clutch actuator for selectively frictionally loading said clutch pack, said actuator comprising:

15 a hydraulic pump for generating a hydraulic pressure to frictionally load said clutch pack; and

a variable pressure relief valve assembly to selectively control said friction clutch pack, said variable pressure relief valve assembly including a valve closure member, a valve seat complementary to said valve closure member, and an electro-magnetic actuator for engaging said valve closure member and urging thereof against
20 said valve seat so as to selectively vary a release pressure of said pressure relief valve assembly based on a magnitude of an electric current supplied to said electro-magnetic actuator,

wherein said valve closure member is movable between a closed position when said valve closure member engages said valve seat and an open position when said valve closure member is axially spaced from said valve seat.

5 2. The torque transfer assembly as defined in claim 1, wherein said electro-magnetic actuator including a coil winding supported by said ring gear assembly and an armature radially spaced from said coil winding and axially movable relative thereto in response to a magnetic flux generated by said coil winding when said electrical current is supplied thereto, said armature engages said valve closure member and urges thereof against said valve seat
10 with an axial force determined by said magnitude of said electric current for selectively setting up said release pressure of said valve closure member.

 3. The torque transfer assembly as defined in claim 2, wherein said coil winding is coaxial to an axis of rotation of said ring gear assembly.

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 4. The torque transfer assembly as defined in claim 2, wherein said coil winding is rotatably supported by said ring gear assembly.

 5. The torque transfer assembly as defined in claim 2, wherein said coil winding is
20 substantially annular in shape and is mounted substantially coaxially to an axis of rotation of said ring gear assembly.

6. The torque transfer assembly as defined in claim 2, wherein said coil winding is wound about a coil housing rotatably mounted to an outer peripheral surface of said ring gear assembly.

5 7. The torque transfer assembly as defined in claim 6, wherein said coil housing is substantially annular in shape and is mounted substantially coaxially to an axis of rotation of said ring gear assembly.

10 8. The torque transfer assembly as defined in claim 2, wherein said armature is non-rotatably coupled to said ring gear assembly.

9. The torque transfer assembly as defined in claim 2, wherein said armature is disposed outside said coil winding of said electro-magnetic actuator.

15 10. The torque transfer assembly as defined in claim 2, wherein said armature is substantially annular in shape and is mounted substantially coaxially to an axis of rotation of said ring gear assembly.

20 11. The torque transfer assembly as defined in claim 1, wherein said friction clutch assembly is a friction clutch pack including a plurality of inner friction plates coupled to rotate with said differential assembly and a plurality of outer friction plate coupled to rotate with said ring gear assembly, said friction plates being frictionally engageable with one another.

12. The torque transfer assembly as defined in claim 1, wherein said hydraulic pump is disposed within a housing defined by said ring gear assembly and generates a hydraulic pressure in response to relative rotation between said ring gear assembly and said differential assembly.

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13. The torque transfer assembly as defined in claim 12, wherein said pump is a gerotor pump.

14. The torque transfer assembly as defined in claim 1, wherein said variable pressure relief valve assembly is adapted to selectively set a maximum hydraulic pressure attainable within said ring gear assembly between a maximum release pressure and a minimum release pressure.

15. The torque transfer assembly as defined in claim 1, wherein said hydraulic clutch actuator further including a piston assembly disposed within said ring gear assembly between said pump and said clutch pack and defining a pressure chamber, wherein said variable pressure relief valve assembly selectively controls a maximum hydraulic pressure attainable within said pressure chamber.

16. The torque transfer assembly as defined in claim 15, wherein said variable pressure relief valve assembly selectively controls said maximum pressure attainable within said pressure chamber between a maximum release pressure and a minimum release pressure.

17. The torque transfer assembly as defined in claim 16, wherein said minimum release pressure is at a level that prevents actuation of said friction clutch pack.

5 18. The torque transfer assembly as defined in claim 16, wherein said maximum release pressure is at a level that enables complete actuation of said friction clutch pack.

19. The torque transfer assembly as defined in claim 16, wherein said maximum hydraulic pressure attainable within said pressure chamber is adjustable between said
10 minimum release pressure and said maximum release pressure so as to enable partial actuation of said friction clutch pack.

20. The torque transfer assembly as defined in claim 1, wherein said variable pressure relief valve assembly is adapted to selectively set a maximum hydraulic pressure attainable
15 within said ring gear assembly between a maximum and a minimum release pressure.

21. The torque transfer assembly as defined in claim 20, wherein said minimum release pressure is at a level that prevents actuation of said friction clutch pack.

20 22. The torque transfer assembly as defined in claim 20, wherein said maximum release pressure is at a level that enables complete actuation of said friction clutch pack.

23. The torque transfer assembly as defined in claim 20, wherein said maximum hydraulic pressure attainable within said ring gear assembly is adjustable between said minimum release pressure and said maximum release pressure so as to enable partial actuation
5 of said friction clutch pack.

24. The torque transfer assembly as defined in claim 2, wherein said armature has a substantially U-shaped cross-section.

10 25. The torque transfer assembly as defined in claim 2, wherein said coil winding is wound about a coil housing rotatably mounted to said ring gear assembly and wherein said armature is off-set from said coil housing to a distance that ensures that said axial force applied upon said valve closure member by said electro-magnetic actuator is substantially constant as said valve closure member moves from said closed position to said open position
15 and said axial force is a function only of said electrical current supplied to said coil winding.